
Project Number: 00330-10

Prepared for:

CORE TECHNOLOGY
1626 Vineyard
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By

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January 2000

CERTIFICATION
Electromagnetic Interference
Test Report

CORE TECHNOLOGY
TX240V Transmitter Operating with
The CTR241 Wireless Home Observation System
(Intentional Radiator Portion)

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THIS REPORT SHALL NOT BE REPRODUCED EXCEPT IN FULL, WITHOUT THE WRITTEN APPROVAL OF PROFESSIONAL TESTING (EMI), INC.



Certificate of Compliance

Applicant: Core Technology
 Applicant's Address: 1626 Vineyard
 Grand Prairie, Texas 75052
 Model: TX240V Transmitter
 Serial Number: N/A
 Project Number: 00330-10
 Test Dates: December 16, 1999

I, Jeffrey A. Lenk, for Professional Testing (EMI), Inc., being familiar with the FCC rules and test procedures have reviewed the test setup, measured data and this report. I believe them to be true and accurate.

The **Core Technology TX240V Transmitter** was tested to and found to be in compliance with FCC Part 15 Subpart C for an Intentional Radiator.

The highest emissions generated by the above equipment are listed below:

	<u>Frequency (GHz)</u>	<u>Level (dBμV/m)</u>	<u>Limit (dBμV/m)</u>	<u>Margin (dB)</u>
Fundamental	2.432	92.6	94.0	-1.4
Spurious	4.864	53.4	54.0	-0.6

Occupied Bandwidth

Record Only Per 47 CFR 15 - Widest OCBW: 86.0 kHz

Jeffrey A. Lenk
 President

This report has been reviewed and accepted by Core Technology. The undersigned is responsible for ensuring that the **TX240V Transmitter** will continue to comply with the FCC rules.

1.0 EUT Description

The Equipment Under Test (EUT) is the **Core Technology TX240V Transmitter** operating with the CTR241 wireless home observation system. The **TX240V Transmitter** is used to control the observation system at home. The transmitting frequency of **TX240V Transmitter** is 2.432 GHz. The EUT is designed for compliance with 47 CFR 15.249 of the FCC rules. Specific test requirements for this device include the following:

47 CFR 15.249	Fundamental Transmit Power
47 CFR 15.249 & 15.205	Spurious Radiated Power
47 CFR 15.231 & 2.1049	Occupied Bandwidth (2.989 used as Procedural Reference)
47 CFR 15.203	Antenna Requirement

The system tested consisted of the following:

<u>Manufacturer & Model</u>	<u>Serial #</u>	<u>FCC ID #</u>	<u>Description</u>
Core Technology TX240V Transmitter	N/A	OU4TX240V	Low Power Transmitter

A separate verification report pursuant to Part 15, Subpart B has been prepared for the **Core Technology, TX240V Transmitter** as a Digital Device.

1.1 EUT Operation

The **TX240V Transmitter** was tested with the wireless link active and fully modulated. Setup and operational modes cover worst case configuration and operational modes for the device. The frequency of the transmitting signal is 2.432 GHz.

2.0 Electromagnetic Emissions Testing

Professional Testing (EMI), Inc. (PTI), follows the guidelines of NIST for all uncertainty calculations, estimates and expressions thereof for EMC testing.

Radiated emission measurements were made of the Fundamental and Spurious Emission levels for the **TX240V Transmitter**. Measurements of the occupied bandwidth were also made for the equipment.

Measurements of the maximum emission levels for the fundamental and the spurious/harmonic emissions of the **TX240V Transmitter** were made at the Professional Testing "Open Field" Site 1, located in Marble Falls, Texas to determine the radio noise radiated from the EUT. A "Description of Measurement Facilities" has been submitted to the FCC and approved pursuant to Section 2.948 of CFR 47 of the FCC rules.

Tests of the fundamental for the device were performed to determine the worst case polarization of the devices. The fundamental emissions of the device were measured with the antennas of the devices vertical and horizontal to the ground plane.

2.1 Test Procedure

The EUT was placed on a non-conductive table 0.8 meters above the ground plane. The table was centered on a motorized turntable which allows 360 degree rotation. For measurements of the fundamental signal, a measurement antenna was positioned at a distance of 3 meters as measured from the closest point of the EUT. For spurious/harmonic measurements above 1 GHz, the measurement antenna was placed 1 meter from the EUT. The radiated emissions were maximized by configuring the EUT, by rotating the EUT, and by raising and lowering the antenna from 1 to 4 meters.

A Spectrum Analyzer with peak detection was used to find the maximums of the radiated emissions during the variability testing. A drawing showing the test setup is given as Figure 1.

2.2 Test Criteria

The table below shows FCC Part 15.249 radiated limits for an intentional radiator operating at 417.9 MHz band. In addition to these requirements, the EUT must meet the restricted emission band requirements of §15.205. The spurious measurements of the harmonic were performed to the 10th harmonic of the fundamental. The reference distance for each limit is also shown in this table.

<u>Signal Type</u>	<u>Test Distance (Meters)</u>	<u>Field Strength</u>	
		<u>(μV/m)</u>	<u>(dBμV/m)</u>
Fundamental (417.9 MHz)	3	50000	94.0
Harmonics	3	500	54.0
Harmonics	1	1500	63.5

2.3 Test Results

The radiated test data for the fundamental is included in Appendix A. Quasi-Peak detector has been used during the test. The radiated emission test data for the harmonics is included in Appendix B. The emissions were maximized at each frequency and the highest emissions identified were measured using peak detection. The radiated emissions generated by the **TX240V Transmitter** are below the FCC Part 15.249 and FCC Part 15.205 maximum emission criteria.

3.0 Occupied Bandwidth Measurements

Measurements of the occupied bandwidth for the fundamental signals of the of the FCC Part 15.249 were made at the Professional Testing's Round Rock, Texas laboratory. All measurements were made in a controlled indoor environment in a configuration which did not present measurement distortion or ambient interference.

3.1 Test Procedure

The EUT was placed on a non-conductive table 0.8 meters above the floor. The table was rotated to an angle which presented the highest signal level. The occupied bandwidth was also measured on the device. Peak detection was used for all tests. The occupied bandwidth was based on a 26 dB criteria (26 dB down either side of the emission from the nominal center of the emission). A drawing showing the test setup is given as Figure 1.

3.2 Test Criteria

According to FCC Part 15.231, the bandwidth of the emission shall not be wider than 0.5 % of the center frequency for the devices operating above 900 MHz. The limit is 12.16 MHz for the transmitter working at 2.432 GHz.

Measurement of the occupied bandwidth was performed to verify that the emission bandwidth from the EUT did not exceed 12.16 MHz. The typical occupied bandwidth for the module is 86 kHz.

3.3 Test Results

The occupied bandwidth test data is included in Appendix C. The occupied bandwidth for the fundamental frequency (2.432 GHz) is 86 kHz. The figure is typical for the **TX240V Transmitter**.

The intended center frequency for the EUT was centered at 2.432 GHz. The center frequency is within the allowed band. The fundamental signal generated by the **TX240V Transmitter** is within the band allowed under FCC Part 15.231 emission band criteria.

4.0 Antenna Requirement

An analysis of the **TX240V Transmitter** was performed to determine compliance with Section 15.203 of the Rules. This section requires specific handling and control of antennas used for devices subject to regulations under the Intentional Radiator portions of Part 15.

4.1 Evaluation Procedure

The structure and application of the **TX240V Transmitter** were analyzed with respect to the rules. There is not internal and external antenna on the EUT.

4.2 Evaluation Criteria

Section 15.203 of the rules states that the subject device must meet at least one of the following criteria:

- (a) Antenna be permanently attached to the unit.
- (b) Antenna must use a unique type of connector to attach to the EUT.
- (c) Unit must be professionally installed. Installer shall be responsible for verifying that the correct antenna is employed with the unit.

4.3 Evaluation Results

The **TX240V Transmitter** meets the criteria of this rule by virtue of having an external antenna permanently attached to the unit. The EUT is therefore compliant with §15.203.

5.0 Modifications to Equipment

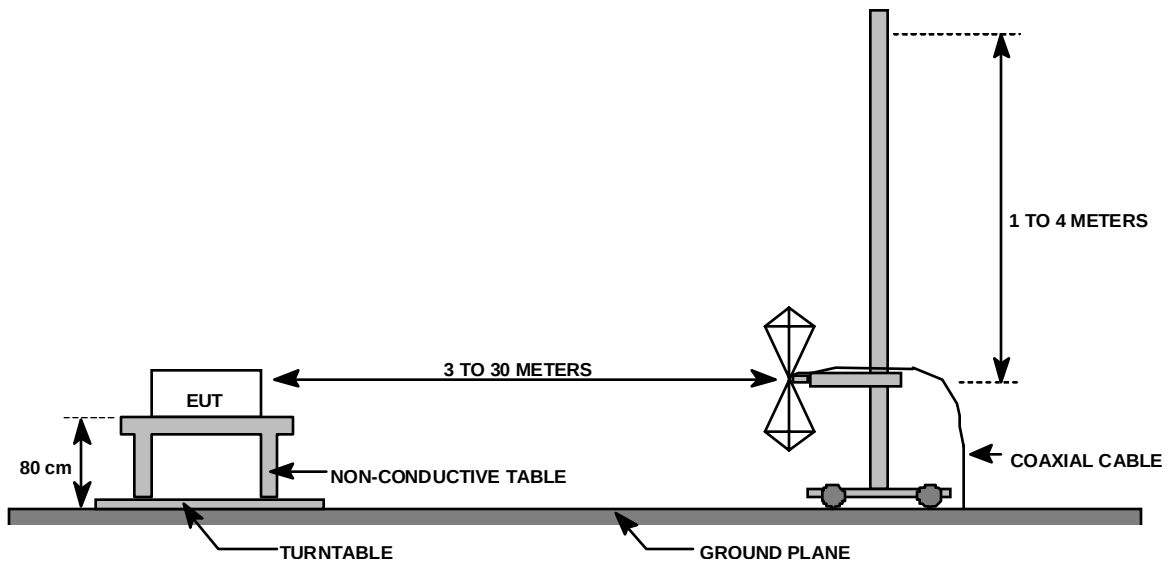
There were no modifications made on the **TX240V Transmitter** during the performance of the test program in order to meet the FCC criteria.

6.0 List of Test Equipment

A list of the test equipment utilized to perform the testing is given below. The date of calibration is given for each.

Electromagnetic Emissions Test Equipment

<u>Device</u>	<u>Description</u>	<u>Date Last Calibrated</u>	<u>Calibration Due</u>
HP 8566B	Spectrum Analyzer	07/22/99	07/22/00
HP 85650A	Quasi Peak Adapter	11/19/99	11/19/00
EMCO 3115	Microwave Antenna	05/21/99	05/21/00
LambdaMetrics ZKL1500-1	Preamp	11/05/99	11/05/00

FIGURE 1: Radiated Emissions Test Setup

Appendix A

Radiated Emissions Data Sheets

Fundamental Radiated Data Sheet**Core Technology
TX240V Transmitter**

SERIAL #: N/A
 DATE: 12//16/99
 PROJECT #: 00330-10

MEASUREMENT DISTANCE (m): 3
 DETECTOR FUNCTION: Quasi-Peak

Antenna Horizontal

Freq. (MHz)	EUT Dir. (Deg.)	Antenna Height (Meter)	Recorded Level (dBuV)	Antenna Factor (dB/m)	Cable Loss (dB)	Corrected Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)
2.432	75.0	2.0	55.5	29.0	8.1	92.6	94.0	-1.4

Antenna Vertical

Freq. (MHz)	EUT Dir. (Deg.)	Antenna Height (Meter)	Recorded Level (dBuV)	Antenna Factor (dB/m)	Cable Loss (dB)	Corrected Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)
2.432	224.0	1.0	46.4	29.0	8.1	83.5	94.0	-10.5

Corrected Level = Recorded Level + Antenna Factor + Cable Loss

Comment1: 6.0 dB attenuator was used before the spectrum analyzer, the attenuation was compensated in the Cable Loss.

TEST ENGINEER: _____ **APPROVED BY:** _____
 Larry Zhou Jeffrey Lenk

Appendix B

Spurious Radiated Emissions Data Sheets

Spurious Radiated Data Sheet**Core Technology
TX240V Transmitter**

SERIAL #: N/A
 DATE: 12/16/1999
 PROJECT #: 00330-10

MEASUREMENT DISTANCE (m): 1
 ANTENNA POLARIZATION: Horizontal
 DETECTOR FUNCTION: Peak

Freq. (GHz)	EUT Dir. (Deg.)	Recorded Level (dBuV)	Antenna Factor (dB/m)	Cable Loss (dB)	Corrected Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)
4.864	212	9.8	33.5	10.1	53.4	54.0	-0.6
7.296	56	5.3	35.6	11.4	52.3	54.0	-1.7
9.728	170	2.7	36.9	4.2	43.8	63.5	-19.7
12.160	0	0.0	37.9	5.8	43.7	63.5	-19.8
14.592	0	0.0	38.8	7.4	46.2	63.5	-17.3
17.024	0	0.0	42.7	9.0	51.7	63.5	-11.8
19.456	0	0.0	43.0	10.6	53.6	63.5	-9.9

Corrected Level = Recorded Level + Antenna Factor + Cable Loss

COMMENT #1: EUT Horizontal.

COMMENT #2: Antenna Elevation optimized at 1 meter.

COMMENT #4: EUT at 3 meter for the measurement of 2nd and 3rd harmonics.

TEST ENGINEER: _____ APPROVED BY: _____

Larry Zhou

Jeffrey Lenk

Spurious Radiated Data Sheet

**Core Technology
TX240V Transmitter**

SERIAL #: N/A
DATE: 12/16/1999
PROJECT #: 00330-10

MEASUREMENT DISTANCE (m): 1
ANTENNA POLARIZATION: Vertical
DETECTOR FUNCTION: Peak

Freq. (GHz)	EUT Dir. (Deg.)	Recorded Level (dBuV)	Antenna Factor (dB/m)	Cable Loss (dB)	Corrected Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)
4.864	242	9.7	33.5	10.1	53.3	54.0	-0.7
7.296	283	4.0	35.6	11.4	51.0	54.0	-3.0
9.728	180	2.7	36.9	4.2	43.8	63.5	-19.7
12.160	0	0.0	37.9	5.8	43.7	63.5	-19.8
14.592	0	0.0	38.8	7.4	46.2	63.5	-17.3
17.024	0	0.0	42.7	9.0	51.7	63.5	-11.8
19.456	0	0.0	43.0	10.6	53.6	63.5	-9.9

Corrected Level = Recorded Level + Antenna Factor + Cable Loss

COMMENT #1: EUT Horizontal.

COMMENT #2: Antenna Elevation optimized at 1 meter.

COMMENT #4: EUT at 3 meter for the measurement of 2nd and 3rd homonics.

TEST ENGINEER: _____ APPROVED BY: _____
Larry Zhou Jeffrey Lenk

Occupied

Appendix C

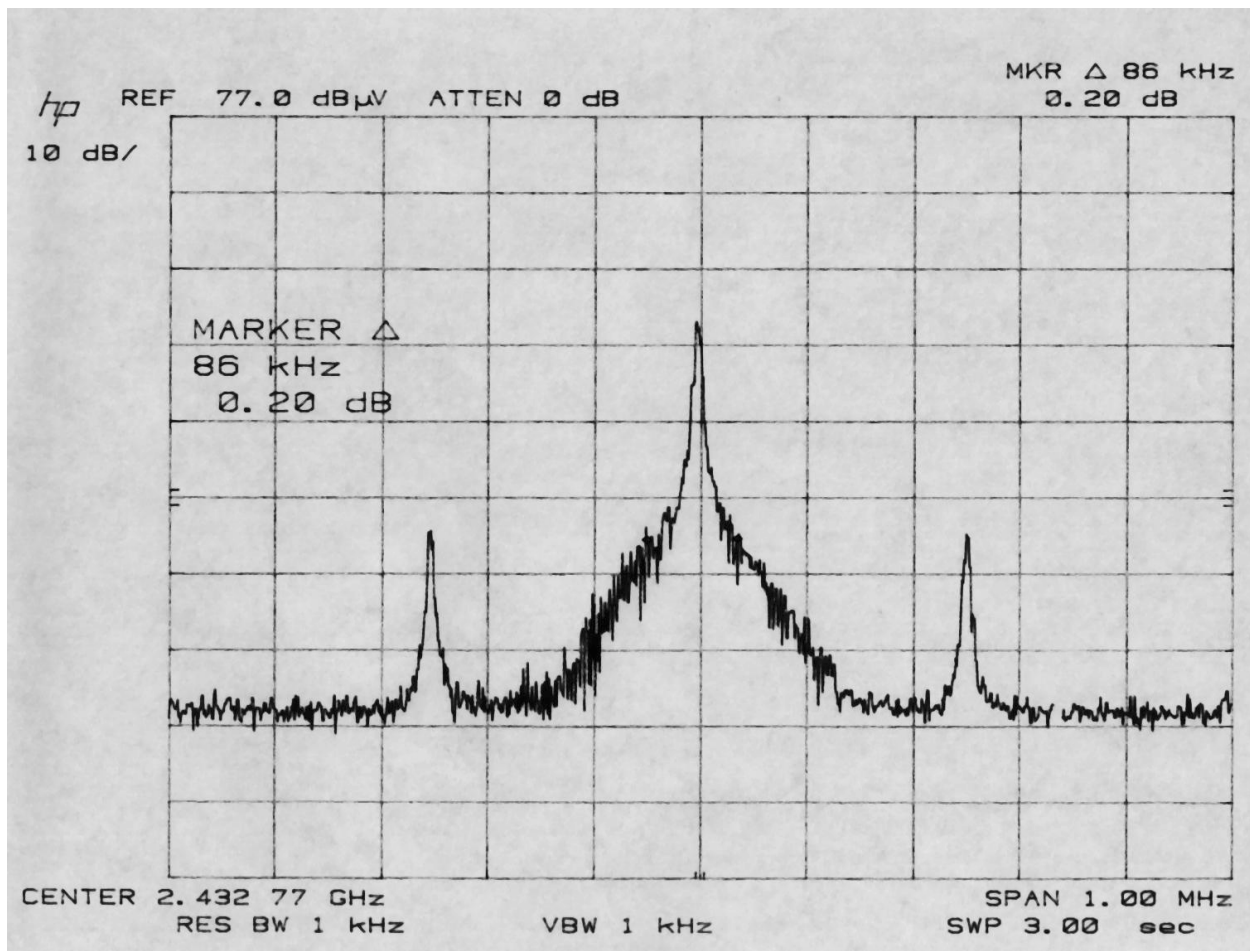
Bandwidth Data Sheets

Occupied Bandwidth Datasheet

Core Technology
TX240V Transmitter

SERIAL #: N/A
 DATE: 12/16/99
 PROJECT #: 00330-10

MEASUREMENT DISTANCE (m): 1.0
 ANTENNA POLARIZATION: Horizontal
 DETECTOR FUNCTION: Peak



COMMENT #1: 26dB Bandwidth = 86.0 kHz

COMMENT #2:

TEST ENGINEER: _____ APPROVED BY: _____
 Larry Zhou Jeffrey Lenk